

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF TENNESSEE
AT CHATTANOOGA

THOMAS WALLS,)	
)	
Plaintiff,)	
)	Case No. 1:15-cv-00139
v.)	
)	McDonough/Lee
BILL JOHNSON, President and CEO,)	
TENNESSEE VALLEY AUTHORITY,)	
)	
Defendant.)	

DECLARATION OF LIESL M. FOX, Ph.D.

Comes Liesl M. Fox, Ph.D., pursuant to 28 U.S.C. § 1746 and under penalty of perjury under the laws of the United States of America, and gives the following Declaration:

1. I am over 21 years of age and competent to make this Declaration. The facts contained herein are within my personal knowledge.

2. I am a Senior Consultant and have been employed by Quantitative Research Associates, a firm that provides statistical and computing consulting services, since 1997. I have been a statistical consultant for over 20 years, including conducting analyses in the fields of employment litigation and medical research, and have testified numerous times as an expert witness. I have both a Masters and Doctorate degree in Biostatistics from the University of Alabama at Birmingham. A copy of my curriculum vitae is attached hereto as Exhibit 1.

3. I have been retained by Plaintiff as an expert witness in the above-reference lawsuit. Attached hereto as Exhibit 2 is a true and correct copy of the Expert Report which I prepared and signed on May 25, 2016. I incorporate by reference the entire contents of my Expert Report as my sworn testimony in this lawsuit.

4. Attached hereto as Exhibit 3 is a true and correct copy of the Supplemental Expert Report which I prepared and signed on July 26, 2016. I incorporate by reference the entire contents of my Expert Report as my sworn testimony in this lawsuit.

5. I affirm that the findings, statements, conclusions and opinions set forth in my Expert Report and Supplemental Expert Report are true and correct, and I am prepared to testify under oath to such at the trial of this matter.

Pursuant to 28 U.S.C. §1746, I declare under penalty of perjury under the laws of the United States of America that the foregoing Declaration is true and correct to the best of my knowledge.

This 2nd day of August, 2016.



LIESL M. FOX, Ph.D.

Liesl Mae Fox

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Education

B.S. in Mathematics
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Professional Experience

2000 to Present

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- 1994 to 1997 Statistician
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- 1994 to 1997 Statistical Consultant
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Honors

- ❖ Outstanding Doctoral Student, School of Public Health, Academic Year 1997-1998
- ❖ UAB Graduate School Fellowship, 1992 to 1995
- ❖ Delta Omega, Public Health Scholastic Honorary, 1995
- ❖ Phi Kappa Phi, Scholastic Honorary, 1994
- ❖ Outstanding Math Education Student, Academic Year 1990-1991
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- ❖ Who's Who in American Colleges & Universities, 1991

Professional Memberships

- ❖ American Statistical Association, 1996 to Present

Publications

Fox LM. (1995). *The pseudo-binomial distribution: Applications in survival analysis*. Master's thesis, University of Alabama at Birmingham.

Webb JM, Rye B, Fox LM, Smith SD, Cash J. (1996). State of dermatology training: The resident's perspective. *Journal of the American Academy of Dermatology*, 34(6):1067-1071.

Fox LM. (1997). *An exploration of the pseudo-binomial distribution with applications to survival curve confidence intervals*. Doctoral dissertation, University of Alabama at Birmingham.

Sanchez OM, Childers NK, Fox LM, Bradley E. (1997). Physicians' views on pediatric preventive dental care. *Pediatric Dentistry*, 19(6):377-383.

Publications (Continued)

Nurko C, Aponte-Merced L, Bradley EL, Fox LM. (1998). Dental caries prevalence and dental health care of Mexican-American workers' children. *Journal of Dentistry for Children*, 65(1):65-72.

Mathur A, Roubin GS, Iyer SS, Piamsonboon C, Liu MW, Gomez CR, Yadav SS, Chastain HD, Fox LM, Dean LS, Vitek JJ. (1998). Predictors of Stroke Complicating Carotid Artery Stenting. *Circulation*, 97(13):1239-1245.

Azziz R, Rittmaster RS, Fox LM, Bradley EL, Potter HD, Boots LR. (1998). Role of the ovary in the adrenal androgen excess of hyperandrogenic women. *Fertility & Sterility*, 69(5):851-859.

Azziz R, Black V, Hines GA, Fox LM, Boots LR. (1998). Adrenal androgen excess in the polycystic ovary syndrome: Sensitivity and responsivity of the hypothalamic-pituitary-adrenal axis. *The Journal of Clinical Endocrinology & Metabolism*, 83(7):2317-2323.

Buyalos RP, Jackson RV, Grice GI, Hockings GI, Torpy DJ, Fox LM, Boots LR, Azziz R. (1998). Androgen response to hypothalamic-pituitary-adrenal stimulation with naloxone in women with myotonic muscular dystrophy. *Journal of Clinical Endocrinology & Metabolism*, 83(9):3219-3224.

Azziz R, Rittmaster RS, Fox LM, Bradley EL, Potter HD, Boots LR (1998): Letter to the Editor. Re: The effect of ovarian steroid production on adrenal steroidogenesis?. *Fertility and Sterility*, 70:1187-1189.

Tanner JL, Craig CB, Bartolucci AA, Allon M, Fox LM, Geiger BF, Wilson NP. (1998). The effect of a self-monitoring tool on self-efficacy, health beliefs, and adherence in patients receiving hemodialysis. *Journal of Renal Nutrition*, 8(4):203-211.

Kuehne SAM, Everson MP, Gay S, Fox LM, Bradley EL, Garth WP, Haentzschel H, Fine PR, Gay RE. (1997). Antibodies to Type II collagen following traumatic knee injury. *Clinical Immunology and Immunopathology*. Submitted.

Azziz R, Hincapie LA, Knochenhauer ES, Dewailly D, Fox LM, Boots LR. (1999). Screening for 21-hydroxylase deficient non-classic adrenal hyperplasia among hyperandrogenic women: A prospective study. *Fertility and Sterility*, 72(5):915-925.

Smith BA, Morgan SL, Vaughn WH, Fox LM, Canfield GJ, Bartolucci AA. (1999). Comparison of a computer-based food frequency questionnaire for calcium intake with two other assessment tools. *Journal of the American Dietetic Association*, 99(12):1579-1581.

Thomson SW, Heimburger DC, Cornwell PE, Turner ME, Sauberlich HE, Fox LM, Butterworth CE. (2000). Correlates of total plasma homocysteine: Folic acid, copper, and cervical dysplasia. *Nutrition*, 16(6):411-416.

Publications (Continued)

Thomson SW, Heimburger DC, Cornwell PE, Turner ME, Sauberlich HE, Fox LM, Butterworth CE. (2000). Effect of total plasma homocysteine on cervical dysplasia risk. *Nutrition & Cancer*, 37(2):128-133.

Azziz R, Fox LM, Zacur HA, Parker CR, Boots LR. (2001). Adrenocortical secretion of dehydroepiandrosterone in healthy women: highly variable response to adrenocorticotropin. *Journal of Clinical Endocrinology & Metabolism*, 86(6):2513-2517.

Abstracts and Presentations

Nurko C, Aponte-Merced L, Bradley E, Fox LM. (1996). Dental caries and dental care of Mexican-American migrant children. *Pediatric Dentistry*, 18(2):170.

Wisniewski JF, Curcio BF, Bartolucci AA, Fox LM, Lovell J. (1996). Patterns of nicotine and alcohol usage in professional baseball players. *Journal of Dental Research*, 75(Special Issue):82, IADR abstract 517.

Azziz R, Dewailly D, Cortet-Rudelli C, Fox LM, Bradley EL, Boots LR. (1996, June). 11 β -hydroxylase (11-OH) activity is not exaggerated in 21-hydroxylase (21-OH) deficient non-classic adrenal hyperplasia (NCAH). Poster session, 10th International Congress of Endocrinology, San Francisco.

Azziz R, Grice JE, Jackson RV, Hockings GI, Thorpy DJ, Fox LM, Boots LR. (1996, June). Androgen response to hypothalamic-pituitary-adrenal stimulation with naloxone in patients with myotonic muscular dystrophy (DM). Poster session, 10th International Congress of Endocrinology, San Francisco.

Azziz R, Rittmaster RS, Fox LM, Bradley EL, Potter HD, Boots LR. (1996, June). Changes in dehydroepiandrosterone (DHA) sulfate (DHS) levels during ovarian suppression of hyperandrogenic women do not reflect alterations in the ACTH-stimulated secretion of DHA. Poster session, 10th International Congress of Endocrinology, San Francisco.

Wisniewski JF, Curcio BF, Fox LM, Bartolucci AA, Lovell J, Lasky L, Lunetta D. (1997). American "spit tobacco" behavior patterns: Cultural and demographic associations among athletes. *Journal of Dental Research*, 76(Special Issue):88, IADR abstract 600.

Wisniewski JF, Ryan M, Bartz SD, Fox LM, Bartolucci AA. (1997). Nicotine use among a group of National Football League (NFL) players. *Journal of Dental Research*, 76(Special Issue):89, IADR abstract 601.

Azziz R, Hincapie LA, Conway-Myers BA, Knochenhauer ES, Fox LM, Cortet-Rudelli C, Dewailly D, Boots LR. (1998). Screening for 21-hydroxylase (21-OH) deficient non-classic adrenal hyperplasia (NCAH) in hyperandrogenic (HA) women: A prospective study. *The Endocrine Society*.

Legal Testimony

Abdela Tum, et al., vs Barber Foods, Inc.: 00-371-P-C (2002): US District Court for the District of Maine. Charles Dixon, plaintiff attorney. Claim for uncompensated time worked. By deposition.

Oliver Dean, et al., vs International Truck and Engine Corp, et al.: CV-01-C-7955 (2004): US District Court for the Northern District of Illinois, Eastern Division, Judge Elaine E. Bucklo. Lee Winston, plaintiff attorney. Racial discrimination in hiring. By deposition.

Bill Robinson, et al. vs Gordon R. England: 1:02-CV-94-2 (WLS) (2005): US District Court for the Middle District of Georgia, Albany Division, Judge Sands. Rocco Calamusa, plaintiff attorney. Racial discrimination in hiring and promotion. By deposition.

Quinton Brown, et al. vs. Nucor Corporation: 2:04-CV-22005-12BG (2006): US District Court for the District of South Carolina, Charleston Division. Robert L. Wiggins, plaintiff attorney. Racial discrimination in promotions. By deposition.

Douglas Powers, et al. vs. U.S. Department of Transportation: 4-99-4127 and 4-99-4106 (2007): US Equal Employment Opportunity Commission, Chicago District Office. Robert F. Childs, plaintiff attorney. Gender and age discrimination in raises. By deposition.

Charles Morrow, et al. v. Flowers Foods, Inc., et al.: 3:07-CV-617-MHT (2008): US District Court for the Middle District of Alabama, Judge Myron Thompson. Amy Weaver, plaintiff attorney. Claim for uncompensated time worked. By deposition.

Susie Knott, et al. v. Dollar Tree Stores, Inc.: 7:06-CV-1553-LSC (2009): US District Court for the Northern District of Alabama, Judge L. Scott Coogler. Robert F. Childs, plaintiff attorney. Claim for uncompensated time worked. By deposition.

Linda Johnson, et al. v. Koch Foods, LLC: 2:2007-CV-0051 (2010): US District Court for the Eastern District of Tennessee at Greenville, Judge Leon Jordan. Jerry Martin, plaintiff attorney. Claim for uncompensated time worked. By deposition.

Wanda Womack, et al. v. Dollar General, et al.: 2:06-CV-0465-VEH (2010): US District Court for the Northern District of Alabama, Southern Division, Judge Virginia Emerson Hopkins. Robert L. Wiggins, plaintiff attorney. Gender discrimination in salaries. By deposition.

Williams, et al. v. Tyson Foods, Inc.: 07-CV-00093 (2010): US District Court for the Middle District of Georgia, Columbus Division. Christine Webber, plaintiff attorney. Claim for uncompensated time worked. By deposition.

Lopez, et al. v. Tyson Foods, Inc.: 8:06-CV-459-LES-TDT (2011): US District Court for the District of Nebraska. Robert L. Wiggins, plaintiff attorney. Claim for uncompensated time worked. By deposition and at trial.

Tom Kunstmann, et al. v. Aaron Rents, Inc.: CV-08-AR-1969-WMA (2011): US District Court for the Northern District of Alabama, Southern Division. Gregory Wiggins, plaintiff attorney. Claim for uncompensated time worked. By deposition.

Bouaphakeo, et al. v. Tyson Foods, Inc.: 5:07-CV-4009-JAJ-TJS (2011): US District Court for the Northern District of Iowa. Robert L. Wiggins, plaintiff attorney. Claim for uncompensated time worked. By deposition and at trial.

Maria Guyton, et al. v. Tyson Foods, Inc.: 3:07-CV-00088-JAJ-TJS (2012): US District Court for the Southern District of Iowa. Robert L. Wiggins, plaintiff attorney. Claim for uncompensated time worked. At trial.

Kenneth Campbell, et al. v. National Railroad Passenger Corporation, et al.: 1:99-CV-02979 (2012): US District Court for the District of Columbia. Robert F. Childs, plaintiff attorney. Racial discrimination in promotions and disciplines. By deposition.

Manual Acosta, et al., v. Tyson Foods, Inc.: 8:08-CV-00086-JFB-TDT (2013): US District Court for the District of Nebraska. Robert L. Wiggins, plaintiff attorney. Claim for uncompensated time worked. At trial.

Vonda Noel, et al., v. Metropolitan Government of Nashville and Davidson County, Tennessee: 3:11-CV-519 (2013): US District Court for the Middle District of Tennessee. David Garrison, plaintiff attorney. Claim for uncompensated time worked. By deposition.

Davina Hurt, et al., v. Commerce Energy, Inc., et al.: 1:12-CV-00758 (2014): US District Court for the Northern District of Ohio. Nicole Fiorelli, plaintiff attorney. Claim for uncompensated time worked. By deposition.

Calvin Childress, et al., v. Ozark Delivery of Missouri, L.L.C., et al.: 09-3133-RED (2014): US District Court for the Western District of Missouri. Brendan J. Donelon, plaintiff attorney. Claim for uncompensated time worked. By deposition.

Beth Ann Sappington v. The Doe Run Resources Corporation: 01-14-0000-8529 (2015): American Arbitration Association, Leland Shurin Arbitrator. Rocco Calamusa, Jr., plaintiff attorney. Claims for uncompensated time worked. At hearing.

Luanna Scott, et al., v. Family Dollar Stores, Inc.: 3:08-cv-540 (2016): US District Court for the Western District of North Carolina. Robert L. Wiggins, plaintiff attorney. Gender discrimination in salaries. By deposition.

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF TENNESSEE
AT CHATTANOOGA

THOMAS WALLS,
Plaintiff,

v.

No. 1:15-CV-00139

BILL JOHNSON, President and CEO,
TENNESSEE VALLEY AUTHORITY,
Defendant.

Expert Report of Liesl M. Fox, Ph.D.

I am a Senior Consultant and have been employed at Quantitative Research Associates, a firm that provides statistical and computing consulting services, since 1997. I have been a statistical consultant for over twenty years, including conducting analyses in the fields of litigation and medical research, and have testified as an expert witness. I am an author of several research articles. My curriculum vitae is attached hereto in Appendix C¹

I specialize in data analysis and the application of statistical methodology to various fields of study. My responsibilities also include database preparation and management. I have worked with data related to different areas of employment. The work discussed in this report, namely, the review and use of data provided by the defendant to determine whether employment decisions have been related to age, is similar to work I have done and testified to prior to preparing this report.

¹ My time is billed at the rate of \$330 per hour.

Introduction

I have been asked by Counsel for the Plaintiff to determine whether recent employment decisions at Tennessee Valley Authority ("TVA") show a pattern of age discrimination. More specifically, I was asked to review the restructuring of the Programmer Analyst and System Analyst positions and the employees selected for reduction in force ("RIF") terminations in the IT Department at TVA since January 1, 2013 to determine whether employees aged 50 years or older were targeted for RIF terminations more often than their younger counterparts.

Conclusions

I found that since January 1, 2013, a statistically significantly disproportionate number of employees aged 50 years or older were targeted for RIF terminations in the IT department at TVA. Similarly, I found that since January 1, 2013, a statistically significantly disproportionate number of employees aged 40 years or older were targeted for RIF terminations in the IT department at TVA. Additionally, I found that the average age of the employees in the IT department at TVA has been decreasing each year since 2012. The statistical evidence establishes adverse impact against older employees in the IT Department at TVA regarding the selection of employees for RIF between January 1, 2013 and January 1, 2015.

Information Relied Upon

- November 25, 2014 *Responses to Interrogatories*, Answers 3 and 4, listing employees assigned to work in the IT department since January 1, 2013 ("IT List");
- Electronic file "Walls v. TVA (Bates Range TVA-Walls 00010200 to 00010271).xls" ("Employee Data");
- Electronic file "TVA Walls 00011494 - CONFIDENTIAL - MASTER IT DOC - 2014.xlsx" ("March 2014 Data"); and,
- *Complaint*, filed on June 30, 2015 and *Defendant's Answer*, filed on August 3, 2015.

Data Used

The Employee Data identified 53 individuals who were hired externally to work in the IT department between October 21, 2013 and August 10, 2015; 81 individuals who were selected for RIF between January 1, 2014 and January 1, 2015; and, 237 individuals who were awarded a total of 290 temporary or permanent higher grade positions between September 24, 2012 and September 7, 2015. The Employee Data also included dates of birth for employees who were in the IT department as of September 30 each year from 2012 through 2015.

The IT List identified 608 individuals who worked in the IT department between January 1, 2013 and November 15, 2014,² along with their job title and age as of November 15, 2014.³ Included in the IT List were 24 individuals who were identified as selected for RIF between January 1, 2013 and October 28, 2014 who were not identified as selected for RIF in the Employee Data.

The March 2014 Data listed 340 individuals who were employed in the IT Department on March 4, 2014, along with their current job title as of that date. The March 2014 Data also indicated that 175 employees were anticipated to be selected for RIF. However, individuals whose record in the March 2014 Data indicated they were potentially selected for RIF but who were shown as still actively employed in the Employee Data and in the IT List were not counted as selected for RIF in my analyses.

² The most recent termination date shown in the IT List is November 12, 2014. Since the Responses to Interrogatories were submitted on November 25, 2014, I assumed that the IT List includes individuals employed in the IT department between January 1, 2013 and November 15, 2014.

³ A comparison of the ages shown in the IT List to the age calculated as of November 15, 2014 for those individuals for whom a birth date was provided in the Employee Data confirmed that the age included in the IT List was the employee's age as of November 15, 2014.

Calculating Age for Analysis Purposes

Combining the information available in the Employee Data and in the IT List, I found a total of 646 individuals who worked in the IT department during the period from January 1, 2013 through January 1, 2015. Birth dates were provided in the Employee Data for 630 of these employees. For those employees with a known birth date, the age was calculated as age at termination if the employee's termination date was between January 1, 2013 and January 1, 2015, or age as of January 1, 2015 if the employee appeared to be still actively employed. For the ten employees whose birth date was not provided and who appeared to still be actively employed, the age shown in the IT List was used as the employee's age. Similarly, the age shown in the IT List was used for the one employee whose birth date was not provided and whose termination date was February 28, 2014. The age at hire was used for the one employee hired on December 15, 2014 who was not included on the IT List and for whom the birth date was not provided in the Employee Data. Four individuals whose birth dates were not provided and who were not included with their age as of November 15, 2014 in the IT List were excluded from the analyses.

Analysis of Reduction in Force Selections

Of the 642 employees who worked in the IT department between January 1, 2013 and January 1, 2015 and whose age was known, 105 were selected for RIF.⁴ Table 1 shows the results of my analyses comparing the rates of RIF among employees who are under 50 years of age to the rates of RIF among employees who are 50 years or older. There were 77 employees under the age of 50 who worked as either a Programmer Analyst, System Analyst or Software

⁴ Employees whose termination reason was Discharge, Resign, Retire, or was not specified were not counted as having been selected for RIF. Additionally, individuals whose record in the March 2014 Data indicated they were potentially selected for RIF but who were shown as still actively employed in the Employee Data and in the IT List were not counted as having been selected for RIF.

Engineer⁵ between January 1, 2013 and January 1, 2015, only 2 (2.6%) of whom were selected for RIF. In contrast, there were 60 employees 50 years of age or older who worked as either a Programmer Analyst, System Analyst or Software Engineer between January 1, 2013 and January 1, 2015, of whom 32 (53.3%) were selected for RIF. This disparity in the proportion of employees selected for RIF is statistically significant at -6.82 standard deviations.⁶ Similarly, there were 357 employees under the age of 50 who worked in the IT Department between January 1, 2013 and January 1, 2015, only 9 (2.5%) of whom were selected for RIF, while there were 285 employees 50 years of age or older who worked in the IT Department between January 1, 2013 and January 1, 2015, of whom 96 (33.7%) were selected for RIF. This disparity in the proportion of employees selected for RIF is statistically significant at -10.61 standard deviations.

Table 2 shows the results of my analyses comparing the rate of RIF terminations among employees who are under 40 years of age to the rate of RIF terminations among employees who are 40 years or older. There were 50 employees under the age of 40 who worked as either a Programmer Analyst, System Analyst or Software Engineer between January 1, 2013 and January 1, 2015, none (0.0%) of whom were selected for RIF. In contrast, there were 87 employees 40 years of age or older who worked as either a Programmer Analyst, System Analyst or Software Engineer between January 1, 2013 and January 1, 2015, of whom 34 (39.1%) were selected for RIF. This disparity in the proportion of employees selected for RIF is statistically significant at -5.10 standard deviations. Similarly, there were 228 employees under the age of 40 who worked in the IT Department between January 1, 2013 and January 1, 2015, only 4 (1.8%)

⁵ It is my understanding that the Software Engineer position replaced the Programmer Analyst and System Analyst positions.

⁶ Throughout this report, results noted by a negative sign (-) indicate adverse impact against older employees who worked in the IT Department at TVA. The number of standard deviations is a measure of the degree of statistical significance and is discussed in Appendix B.

of whom were selected for RIF, and 414 employees 40 years of age or older who worked in the IT Department during that same period of time, of whom 101 (24.4%) were selected for RIF. This disparity in the proportion of employees selected for RIF is statistically significant at -7.42 standard deviations.

Table 3 compares the average age of employees in the IT Department selected for RIF to the average age of employees in the IT Department who were not selected for RIF. The average age of the 103 employees who worked as Programmer Analysts, System Analysts, or Software Engineers between January 1, 2013 and January 1, 2015 who were not selected for RIF was 41.6 years. In contrast, the average age of the 34 employees who worked as Programmer Analysts, System Analysts, or Software Engineers and were selected for RIF during that same period of time was 58.3 years. This difference is statistically significant at -12.29 standard deviations. Similarly, the average age of the 537 employees who worked in the IT Department between January 1, 2013 and January 1, 2015 who were not selected for RIF was 43.0 years, while the average age of the 105 employees who worked in the IT Department and were selected for RIF during that same period of time was 57.1 years. This difference is statistically significant at -15.97 standard deviations.

Age of IT Department Employees Each Year

The lists included in the Employee Data that purported to show the age of the employees in the IT Department as of September 30 each year for the years 2012 through 2015 were incorrect. For example, William C Abernathy Jr. is listed as 56 years of age for each of those four years. Table 4 shows the average age, correctly computed using each employee's birth date, of the employees identified in the Plaintiff Data as being employed on September 30 each year.

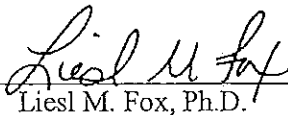
Table 4 shows that the average age of the employees in the IT department has decreased each year from 2012 (45.3 years) through 2015 (43.7 years).

Disposition of Programmer Analysts and System Analysts

There were 79 employees who were identified as having worked as Programmer Analysts in the IT Department between January 1, 2013 and January 1, 2015, of whom 22 were selected for RIF. None of the Programmer Analysts selected for RIF were less than 50 years of age. The employees who were identified as Programmer Analysts are listed in Table 5. There were 34 employees who were identified as having worked as System Analysts in the IT Department between January 1, 2013 and January 1, 2015, of whom 12 were selected for RIF. None of the System Analysts selected for RIF were less than 40 years of age, and only two were less than 50 years of age. The employees who were identified as System Analysts are listed in Table 6. Table 7 lists the 24 individuals who were hired or promoted to the Software Engineer position between January 1, 2013 and January 1, 2015 who did not work as Programmer Analysts or System Analysts.

Concluding Remarks

The opinions that I express herein are based on my education, training, teaching, research, professional consultations, publications, experience and expertise as detailed in my curriculum vitae, other information reasonably relied upon by members of my profession, and my own analyses. If any additional data or information is provided that indicates further analyses need to be conducted, I will file supplemental reports. I may also offer testimony about opinions expressed by Defendants' experts that come under my area of expertise.


Liesl M. Fox, Ph.D.

May 25, 2016
Date

Appendix A
Statistical Tables

Table 1

Terminations Due to Reduction in Force in the IT Department
Rate of RIF Among Employees Under 50 Compared to Employees 50 or Older
January 1, 2013 and January 1, 2015

	Number of Employees Under 50	% RIF Terminations Under 50	Number of Employees 50 or Older	% RIF Terminations 50 or Older	Number of Standard Deviations
Programmer Analysts, System Analysts, and Software Engineers	77	2.6%	60	53.3%	-6.82
IT Department Overall	357	2.5%	285	33.7%	-10.61

Table 2

Terminations Due to Reduction in Force in the IT Department
Rate of RIF Among Employees Under 40 Compared to Employees 40 or Older
January 1, 2013 Through January 1, 2015

	Number of Employees Under 40	% RIF Terminations Under 40	Number of Employees 40 or Older	% RIF Terminations 40 or Older	Number of Standard Deviations
Programmer Analysts, System Analysts, and Software Engineers	50	0.0%	87	39.1%	-5.10
IT Department Overall	228	1.8%	414	24.4%	-7.42

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Table 3

Average Age of Employees Selected for Reduction in Force Terminations
Compared to Employees Not Selected for Reduction in Force Terminations

	Not Selected for RIF		Selected for RIF		Number of Standard Deviations
	Number of Employees	Average Age	Number of Employees	Average Age	
Programmer Analysts, System Analysts, and Software Engineers	103	41.6	34	58.3	-12.29
IT Department Overall	537	43.0	105	57.1	-15.97

Table 4

Average Age of Employees Working in the IT Department

Date	Number of IT Employees	Average Age
September 30, 2012	533	45.3 years
September 30, 2013	534	44.9 years
September 30, 2014	513	44.4 years
September 30, 2015	485	43.7 years

Table 5

Programmer Analyst Employees
January 1, 2013 Through January 1, 2015

Name	Age	Disposition Date ¹	Disposition
Amanda Lucille Judge	27	06/16/2014	Software Engineer
Thomas Blaine Trexler	27	08/24/2015	Software Engineer, ERP
Samuel Aaron McDavid	27	06/16/2014	Software Engineer, ERP
Andrew Alexander Sulzycki	27	06/16/2014	Software Engineer
William Cody Rives	28	06/30/2014	Business Intelligence Engineer
Timothy Allen Bowman	29		Software Engineer
Kent W Hogan	29		Software Engineer
Zachary Kimball Eubanks	30	06/02/2014	Software Engineer
Elizabeth Grace Morgan	31		Software Engineer
Andrew K Hill	31		Software Engineer
David R Rickels	32		Software Engineer, ERP
Keith Alexander Connatser	33	06/02/2014	Software Engineer
Jordan Isaac Headrick	33		Software Engineer
Michael Patrick Reardon	34		Software Engineer
Noah W Spitzer	35	06/16/2014	Business Intelligence Engineer
Shane Anthony Wright	35	06/02/2014	Software Engineer
Matthew C Hensley	35	03/24/2014	Sr Prog Mgr, Data Warehouse
Summer M Prince	36	06/16/2014	Software Engineer
Brandi S Shewbart	36		Software Engineer
Thomas L Still Jr	36	06/02/2014	Software Engineer
Russell E Collins	37		Software Engineer, ERP
Doug Steele	37		Software Engineer
Saul T Stephens	37	06/02/2014	Software Engineer, ERP
Ringo Rocky Long	38	06/02/2014	Software Engineer
Johnny William Housley	39	06/02/2014	Software Engineer
Rachel L Ashby	39	06/02/2014	Software Engineer, ERP
Jeffrey Jerome Hardaway	39		Software Engineer

¹ If the Disposition Date is not shown, then the job title shown is the title the employee held as of November 15, 2014 and the date on which the employee's job title was changed was not provided.

Table 5 (Continued)

Programmer Analyst Employees
January 1, 2013 Through January 1, 2015

Name	Age	Disposition Date ¹	Disposition
William A Duncan	40		Software Engineer, ERP
Scott D Dunn	42		Software Engineer
Jeffrey Scott Long	43		Software Engineer
Phillip Samuel Spurling	44	11/02/2013	Resign
Wendy S Turner	45		Software Engineer, ERP
Jonathan G Hicks	45		Software Engineer
Rodney Stephens	47		Software Engineer
Michael Hall	48		Software Engineer
Patrick Robert Brazelle	48		Software Engineer
Jack E Lowe Jr	49		Software Engineer
Arthur James Watts	49		Software Engineer
Brent G Johnson	49		Software Engineer
Daniel A Rider	50		Software Engineer
Kevin T Hillis	51		Software Engineer
Franklin Eugene Davis	51		Software Engineer
Susan K McKinney	51		Software Engineer
Thomas A Walls, Jr	52	10/28/2014	RIF
Arlene E Wyss	52	10/28/2014	RIF
Francine M Harris	52	06/02/2014	Software Engineer
Patrick B Donohue	52		Software Engineer
E Ray Asbury Jr	53	11/12/2014	RIF
Bradley D Watson	53	06/02/2014	Software Engineer
Eric B McHenry	53		Software Engineer
David Allen Visti	54	08/30/2013	Resign
Jill R Scott	54		Software Engineer, ERP
Becky S Mayes	54		Software Engineer
Donna S Forsythe Burns	54	10/28/2014	RIF
Russell Stuart Holt	55	10/01/2014	RIF

¹ If the Disposition Date is not shown, then the job title shown is the title the employee held as of November 15, 2014 and the date on which the employee's job title was changed was not provided.

Table 5 (Continued)

Programmer Analyst Employees
January 1, 2013 Through January 1, 2015

Name	Age	Disposition Date ¹	Disposition
Robert W Jackson	56		Software Engineer
Carol A Houff	56		Software Engineer
Steven E Isbill	56	11/12/2014	RIF
Kenneth A Walker Jr	56		Software Engineer, ERP
Garry V Wolfe	57	10/28/2014	RIF
Lucy S Hawkins-Oliver	57	06/16/2014	Business Analyst, B
Charles W Jay	57		Software Engineer
Johnny M Braden	58	11/12/2014	RIF
Linda D Stutz	58	11/12/2014	RIF
Terry B Simerly	58	11/12/2014	RIF
Thomas D Curtner	59		Software Engineer
Sherry E Simons	59	11/12/2014	RIF
David A Witt	60	01/31/2014	RIF
Laurie Davis Valiga	60	10/28/2014	RIF
Joseph A Oberst	60	11/12/2014	RIF
Nancy A Willis	60	10/28/2014	RIF
Kerry L Fite	61	11/12/2014	RIF
Carol F Hackney	61	11/12/2014	RIF
M Joanne Martin	61	11/12/2014	RIF
Calvin T Ingle	62	11/12/2014	RIF
Eugene B Bailey	64	10/28/2014	RIF
Jackie Lee Parsons	65		Software Engineer, ERP
Catherine G Burnett	65	10/28/2014	RIF
Johnnie Mae Ratliff	67	10/30/2014	RIF

¹ If the Disposition Date is not shown, then the job title shown is the title the employee held as of November 15, 2014 and the date on which the employee's job title was changed was not provided.

Table 6
System Analyst Employees
January 1, 2013 Through January 1, 2015

Name	Age	Disposition Date ¹	Disposition
Jessica Lauren Philpott	25	06/16/2014	IT Ops Engr - Service Mgmt
Bernard Chad Ullom	32	06/16/2014	IT Product Engineer
William Richard Bauch	33		IT Ops Engr - Service Mgmt
Lauren Heath Jurbergs	33		Software Engineer
Natalie Clowers Allen	34	03/24/2014	Prog Mgr, Techn Selv Svs Sr
Matthew J Franz	34	06/02/2014	Software Engineer
Jeremy B Riley	35		Software Engineer, ERP
Patrick R Johnson	35	06/16/2014	Prog Mgr, Software Eng (Sr)
Shawn Stuart Therrien	39	06/02/2014	Software Engineer, ERP
James Nathan Parker	39	03/24/2014	Prog Mgr, Software Eng (Sr)
Ravi Kumar Chamarti	44	11/12/2014	RIF
Uwe W Radu	44		Software Engineer
Suresh Palaniappan	44		Software Engineer, ERP
Guy M Beaty	45	08/15/2014	RIF
Jeffrey Kinzer	49	06/02/2014	Software Engineer
William Todd Gilreath	51		Data Modeler
Dawn A Thomas	51	08/18/2014	RIF
Robert E Thompson Jr	51		Software Engineer, ERP
Anita D Collins	53		Software Engineer
James A Parsly	56	10/01/2014	RIF
Roger Louis Rollins	56		Software Engineer, ERP
Richard A Bourne	56	06/02/2014	Software Engineer
Gloria E Pogue	56		Software Engineer
Michael P McGee	56		Software Engineer
Michael C Kiser	58	10/06/2014	RIF
John E Holloway	59		Software Engineer, ERP
Danny K Mullins	59	10/28/2014	RIF

¹ If the Disposition Date is not shown, then the job title shown is the title the employee held as of November 15, 2014 and the date on which the employee's job title was changed was not provided.

Table 6 (Continued)

System Analyst Employees
January 1, 2013 Through January 1, 2015

Name	Age	Disposition Date ¹	Disposition
Charles D Dearing	60	10/28/2014	RIF
Jack B Pierce	61	11/14/2013	Terminated: Reason Not Specified
Cynthia A Taylor	62	10/03/2014	RIF
Janet L Arp	62	11/12/2014	RIF
Robert J Bryant	63	10/28/2014	RIF
John A Thompson	64	11/12/2014	RIF
Terry R Cook	65	03/20/2013	RIF

¹ If the Disposition Date is not shown, then the job title shown is the title the employee held as of November 15, 2014 and the date on which the employee's job title was changed was not provided.

Table 7

Software Engineers Who Were Not Programmer Analysts or System Analysts
January 1, 2013 Through January 1, 2015

Name	Age	Disposition Date ¹	Disposition
Andrew Stephen Bikle	23	06/30/2014	Hired
Kelsey Annette Rector France	24	06/30/2014	Hired
Victoria Leigh Baker	24	08/11/2014	Hired
Mitesh Kiran Patel	24	06/16/2014	Promoted
Bryan Anthony Soto	27	07/14/2014	Hired
Chad Alan Schouggins	28	06/16/2014	Promoted
Brian Jonathan Jones	30	10/20/2014	Hired
Nastassia Zianko-Munson	30	08/11/2014	Hired
Warren Lee Parks	32	10/20/2014	Hired
Cody Ryan House	34	06/02/2014	Promoted
Leonisa-Amor Enolva Hermogino	37		
Christopher Joseph Akers	38	06/02/2014	Promoted
Shyni R George John	38	06/02/2014	Promoted
John Craig Robinson	40	10/20/2014	Hired
Harsha Gubbi Sathyanarayana	40	11/03/2014	Hired
Timothy Martin Shults	41	10/20/2014	Hired
David Alen Slemmons	41	09/08/2014	Hired
Kristina M Pleiss	45	(After 03/04/2014) ²	Promoted
Sameer Kumar Jaiswal	46		
Stephen R Hayton	46		
Emubosa Robert Emoghene	46	10/20/2014	Hired
Sivakumar S Ambalam	47	11/03/2014	Hired
Timothy Wade Ebert	49	08/11/2014	Hired
Jonathan W Tun	51	(After 03/04/2014) ²	Promoted

¹ If the Disposition Date is not shown, then the employee held the title of "Software Engineer" as of November 15, 2014 and neither the previous job title nor the date on which the job title was changed was provided.

² Kristina M Pleiss was working as "Web Internet Administrator-B*" as of March 4, 2014, and as "Software Engineer" as of November 15, 2014. Jonathan W Tun was working as "Integration Software Developer" as of March 4, 2014, and as "Software Engineer" as of November 15, 2014. However, the dates on which these employees changed positions were not provided.

Appendix B

Statistical Significance of Adverse Impact

Statistical Significance of Adverse Impact

Statistical significance, in the field of employment discrimination and in other areas of science, is generally accepted as occurring at the 0.05 level of significance (sometimes stated inversely as a 95% confidence level). The larger the number of standard deviations, the smaller the probability, i.e., the less likely the result occurs solely due to chance. Statistical significance means that results are not likely due to chance, but rather, are related to age or some other protected class at a certain confidence level. When testing to determine whether a procedure has adverse impact against a protected group, statistical significance occurs at the 95% confidence level (5% probability of being due to chance). All age differences analyzed in this Report are statistically significant at more than two or three standard deviations from what would be expected if age were a neutral factor. This satisfies a 0.05 probability even using a two-tailed level of significance. However, when testing to determine whether a procedure is related to age or has an adverse impact against a protected group, such as older employees, a one-tailed assumption is appropriate. Statistical significance at the 0.05 level of significance occurs for this type of question when the observed disparity is 1.65 standard deviations from what would be expected in the absence of a correlation between being age and being selected for RIF. The inquiry only changes to an "unsigned" or "two-tailed" issue when the question being asked is whether older employees are selected for RIF at a different rate (either less often or more often) than younger employees. The only question of interest in this case, however, is whether older employees are selected for RIF at a significantly higher rate than younger employees and, if the answer to that one-tailed inquiry is "no," then there is no need to go further by answering the second of a two-tailed inquiry regarding whether older employees are also selected for RIF at a rate significantly *less* than younger employees. Adding that second question to the analysis

doesn't improve the answer to the first question regarding whether the RIF rate among older employees is significantly less than the RIF rate among younger employees, and such an adjustment of the question considered comes at a substantial cost to the statistical power to detect a true negative disparity in the RIF rate among older employees *when it in fact exists*. Adding such a second "tail" to the question being analyzed raises the number of standard deviations necessary to meet the 0.05 level of significance from 1.65 to 1.96 and correspondingly decreases the statistical power of the test to detect a true negative disparity in the RIF rate of older employees when it in fact exists.

I do not believe that the statistical power of the test to detect a significant disparity in the RIF rate of older employees when it really exists should be compromised by reframing the question of interest into a two-tailed inquiry that addresses more than whether the RIF rate of older employees is significantly less than the RIF rate among younger employees. If that difference is not significant, the *relevant* inquiry is at an end without any need to conduct a two-tailed inquiry regarding whether older employees are selected for RIF less often than would be expected by chance.

A 0.05 significance level means that the observed disparity could have occurred by chance only 5% of the time or, stated another way, once in twenty occurrences. Both the one-tailed and two-tailed assumptions declare a result not statistically significant at the 0.05 level of significance if it is less than 1.65 standard deviations, and both assumptions declare a result statistically significant at the 0.05 level of significance if it is 1.96 or more standard deviations. These two assumptions only differ in declaring statistical significance at the 0.05 level of significance if the resulting number of standard deviations lies between 1.65 and 1.96. The computation of the number of standard deviations is the same whether a one-tailed or two-tailed

assumption is used. In this Report, I indicate the number of standard deviations statistic so that the decision regarding the statistical significance of a result can be made by the Court.

Table B

Numbers of Standard Deviations With the Corresponding Confidence Levels and Probabilities of Results Being Due to Chance

Computed Using the Normal Probability Distribution

<u>Number of</u> Standard Deviations	Confidence Level	Chance Probability
1.28	90%	One in ten
1.65	95%	One in twenty
2.33	99%	One in a hundred
3.09	99.9%	One in a thousand
3.72	99.99%	One in ten thousand
4.26	99.999%	One in a hundred thousand
4.75	99.9999%	One in a million
6.00	99.9999999%	One in a billion
7.03	99.999999999%	One in a trillion
7.94	99.999999999999%	One in a quadrillion

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF TENNESSEE
AT CHATTANOOGA

THOMAS WALLS,
Plaintiff,

v.

No. 1:15-CV-00139

BILL JOHNSON, President and CEO,
TENNESSEE VALLEY AUTHORITY,
Defendant.

Supplemental Expert Report of Liesl M. Fox, Ph.D.

I am a Senior Consultant and have been employed at Quantitative Research Associates, a firm that provides statistical and computing consulting services, since 1997. I have been a statistical consultant for over twenty years, including conducting analyses in the fields of litigation and medical research, and have testified as an expert witness. I am an author of several research articles.

I specialize in data analysis and the application of statistical methodology to various fields of study. My responsibilities also include database preparation and management. I have worked with data related to different areas of employment. The work discussed in this report, namely, the review and use of data provided by the defendant to determine whether employment decisions have been related to age, is similar to work I have done and testified to prior to preparing this report.

Introduction

I have been asked by Counsel for the Plaintiff to determine whether recent employment decisions at Tennessee Valley Authority ("TVA") show a pattern of age discrimination. More

specifically, I was asked to review the restructuring of the Programmer Analyst and System Analyst positions and the employees selected for reduction in force ("RIF") terminations in the IT Department at TVA since January 1, 2013 to determine whether employees aged 50 years or older were targeted for RIF terminations more often than their younger counterparts. The Expert Report that I filed on May 25, 2016 contains my conclusions based on the analyses I conducted.

On July 21, 2016, Samuel Held, an Analyst at TVA, filed a Declaration regarding the disposition of the Programmer Analysts at TVA. Additionally, I was also provided with TVA documents that purported to list all individuals employed in the IT Department at TVA between October 1, 2013 and September 30, 2014. I was asked by Counsel for the Plaintiff to review Mr. Held's Declaration and the list of employees in the IT Department to determine whether employees aged 50 years or older were targeted for Involuntary RIF terminations more often than their younger counterparts.¹

Conclusions

In my May 25, 2016 Expert Report, I found that since January 1, 2013, a statistically significantly disproportionate number of employees aged 50 years or older, and aged 40 years or older, were targeted for RIF terminations in the IT department at TVA. The statistical evidence established adverse impact against older employees in the IT Department at TVA regarding the selection of employees for RIF between January 1, 2013 and January 1, 2015.

My review of Mr. Held's Declaration and the list of employees in the IT Department at TVA indicates that a statistically significantly disproportionate number of employees aged 40 years or older, aged 50 years or older, and aged 55 years or older, were targeted for Involuntary RIF terminations in the IT department at TVA. Additionally, Mr. Held's Declaration shows that

¹ My May 25, 2016 Expert Report combined both Voluntary and Involuntary Reduction in Force terminations.

the average age of the group of employees who were working as Programmer Analysts decreased 1.5 years after the Involuntary RIF terminations occurred. The statistical analysis of the data provided by Mr. Held and TVA establishes adverse impact against older employees in the IT Department at TVA regarding the selection of employees for Involuntary RIF terminations between October 1, 2013 and September 30, 2014.

Information Relied Upon

- November 25, 2014 *Responses to Interrogatories*, Answers 3 and 4, listing employees assigned to work in the IT department since January 1, 2013 ("IT List");
- Electronic file "Walls v. TVA (Bates Range TVA-Walls 00010200 to 00010271).xls" ("Employee Data");
- Electronic file "TVA Walls 00011494 - CONFIDENTIAL - MASTER IT DOC - 2014.xlsx" ("March 2014 Data"); and,
- *Complaint*, filed on June 30, 2015 and *Defendant's Answer*, filed on August 3, 2015;
- *Declaration of Samuel Held*, filed on July 21, 2016; and,
- Documents "TVA-Walls 00013673" through "TVA-Walls 00013683" ("TVA IT Listing").

Analysis of the Declaration of Samuel Held

In Exhibit 1 of his Declaration, Mr. Held identifies 76 individuals who worked as Programmer Analysts at TVA as of October 1, 2013. Of those, 56 had not left their position through Voluntary RIF or transfer. Of the 56 Programmer Analysts who remained in their position, 6 were selected for Involuntary RIF terminations. Mr. Held identifies the number of Programmer Analysts and those selected for Involuntary RIF terminations in each of three categories: Over 40, Over 50, and Over 55.

Table S-1 in Appendix A shows the results of my analysis of Mr. Held's table shown in Exhibit 1 of his Declaration. Mr. Held's Declaration indicates that there were 32 employees 40

years of age or older who worked as a Programmer Analyst, 6 (18.8%) of whom were selected for Involuntary RIF. In contrast, there were 24 employees under the age of 40 who worked as a Programmer Analyst, none of whom (0.0%) were selected for Involuntary RIF. This disparity in the proportion of employees selected for Involuntary RIF is statistically significant at -2.24 standard deviations.² Similarly, Mr. Held's Declaration indicates that there were 18 employees 50 years of age or older who worked as a Programmer Analyst, 6 (33.3%) of whom were selected for Involuntary RIF. In contrast, there were 38 employees under the age of 50 who worked as a Programmer Analyst, none of whom (0.0%) were selected for Involuntary RIF. This disparity in the proportion of employees selected for Involuntary RIF is statistically significant at -3.37 standard deviations. Finally, Mr. Held's Declaration indicates that there were 4 employees 55 years of age or older who worked as a Programmer Analyst, 2 (50.0%) of whom were selected for Involuntary RIF. In contrast, there were 52 employees under the age of 55 who worked as a Programmer Analyst, of whom 4 (7.3%) were selected for Involuntary RIF. This disparity in the proportion of employees selected for Involuntary RIF is statistically significant at -2.64 standard deviations.

In his Declaration, Mr. Held also shows the change in the average age of the Programmer Analysts before and after the RIF terminations occur. The average age of all 76 Programmer Analysts was 46.2 years. The average age of the 56 Programmer Analysts who had not left their position through voluntary RIF or transfer was 43.1 years, a decrease of 3.1 years. The average age of the 46 Programmer Analysts who remained after the six selections for Involuntary RIF terminations was 41.5 years, an additional decrease of 1.5 years.

² Throughout this report, results noted by a negative sign (-) indicate adverse impact against older employees who worked in the IT Department at TVA. The number of standard deviations is a measure of the degree of statistical significance and is discussed in Appendix B.

Analysis of the TVA IT Listing

The TVA IT Listing contains the names and ages of 479 individuals who were employed in the IT Department between October 1, 2013 and September 30, 2014, and identifies the 25 employees in the IT Department who were selected for Involuntary RIF terminations.

Table S-2 in Appendix A shows the results of my analysis of Involuntary RIF terminations shown in the TVA IT Listing. The TVA IT Listing indicates that there were 287 employees 40 years of age or older who worked in the IT Department, 22 (7.7%) of whom were selected for Involuntary RIF. In contrast, there were 192 employees under the age of 40 who worked in the IT Department, of whom 3 (1.6%) were selected for Involuntary RIF. This disparity in the proportion of employees selected for Involuntary RIF is statistically significant at -2.94 standard deviations. Similarly, the TVA IT Listing indicates that there were 179 employees 50 years of age or older who worked in the IT Department, 19 (10.6%) of whom were selected for Involuntary RIF. In contrast, there were 300 employees under the age of 50 who worked in the IT Department, of whom 6 (2.0%) were selected for Involuntary RIF. This disparity in the proportion of employees selected for Involuntary RIF is statistically significant at -4.10 standard deviations. Finally, the TVA IT Listing indicates that there were 84 employees 55 years of age or older who worked in the IT Department, 11 (13.1%) of whom were selected for Involuntary RIF. In contrast, there were 395 employees under the age of 55 who worked as a Programmer Analyst, of whom 14 (3.5%) were selected for Involuntary RIF. This disparity in the proportion of employees selected for Involuntary RIF is statistically significant at -3.57 standard deviations.

Concluding Remarks

The opinions that I express herein are based on my education, training, teaching, research, professional consultations, publications, experience and expertise as detailed in my curriculum vitae, other information reasonably relied upon by members of my profession, and my own analyses. If any additional data or information is provided that indicates further analyses need to be conducted, I will file supplemental reports. I may also offer testimony about opinions expressed by Defendants' experts that come under my area of expertise.



Liesl M. Fox, Ph.D.

July 26, 2016

Date

Appendix A
Statistical Tables

JA - 0485

Table S-1

Terminations Due to Involuntary Reduction in Force
Rates of Involuntary RIF Among Programmer Analysts Identified in the *Declaration of Samuel Held*

Age Cutoff Category	Number of Employees Under the Age Cutoff	% Involuntary RIF Terminations Under the Age Cutoff	Number of Employees at or Above the Age Cutoff	% Involuntary RIF Terminations at or Above the Age Cutoff	Number of Standard Deviations
Over 40	24	0.0%	32	18.8%	-2.24
Over 50	38	0.0%	18	33.3%	-3.77
Over 55	52	7.7%	4	50.0%	-2.64

Table S-2

Terminations Due to Involuntary Reduction in Force in the IT Department
Rates of Involuntary RIF Among Employees Identified in the TVA IT Listing¹

Age Cutoff Category	Number of Employees Under the Age Cutoff	% Involuntary RIF Terminations Under the Age Cutoff	Number of Employees at or Above the Age Cutoff	% Involuntary RIF Terminations at or Above the Age Cutoff	Number of Standard Deviations
Over 40	192	1.6%	287	7.7%	-2.94
Over 50	300	2.0%	179	10.6%	-4.10
Over 55	395	3.5%	84	13.1%	-3.57

¹ The TVA IT Listing is comprised of documents Bates numbered "TVA-Walls 00013673" through "TVA-Walls 00013683".

Appendix B

Statistical Significance of Adverse Impact

Statistical Significance of Adverse Impact

Statistical significance, in the field of employment discrimination and in other areas of science, is generally accepted as occurring at the 0.05 level of significance (sometimes stated inversely as a 95% confidence level). The larger the number of standard deviations, the smaller the probability, i.e., the less likely the result occurs solely due to chance. Statistical significance means that results are not likely due to chance, but rather, are related to age or some other protected class at a certain confidence level. When testing to determine whether a procedure has adverse impact against a protected group, statistical significance occurs at the 95% confidence level (5% probability of being due to chance). All age differences analyzed in this Report are statistically significant at more than two or three standard deviations from what would be expected if age were a neutral factor. This satisfies a 0.05 probability even using a two-tailed level of significance. However, when testing to determine whether a procedure is related to age or has an adverse impact against a protected group, such as older employees, a one-tailed assumption is appropriate. Statistical significance at the 0.05 level of significance occurs for this type of question when the observed disparity is 1.65 standard deviations from what would be expected in the absence of a correlation between being age and being selected for RIF. The inquiry only changes to an "unsigned" or "two-tailed" issue when the question being asked is whether older employees are selected for RIF at a different rate (either less often or more often) than younger employees. The only question of interest in this case, however, is whether older employees are selected for RIF at a significantly higher rate than younger employees and, if the answer to that one-tailed inquiry is "no," then there is no need to go further by answering the second of a two-tailed inquiry regarding whether older employees are also selected for RIF at a rate significantly *less* than younger employees. Adding that second question to the analysis

doesn't improve the answer to the first question regarding whether the RIF rate among older employees is significantly less than the RIF rate among younger employees, and such an adjustment of the question considered comes at a substantial cost to the statistical power to detect a true negative disparity in the RIF rate among older employees *when it in fact exists*. Adding such a second "tail" to the question being analyzed raises the number of standard deviations necessary to meet the 0.05 level of significance from 1.65 to 1.96 and correspondingly decreases the statistical power of the test to detect a true negative disparity in the RIF rate of older employees when it in fact exists.

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